

Claims

1. A communication device applied to each apparatus forming a network system comprising:

transmission processing means for transmitting various kinds of data;

timer means for counting a continuous operation request effective time during which transmitted data is always received;

transmission control means for controlling the transmission processing means to transmit data in which is set continuous operation request information causing the timer means in a communication device applied to an intermittent apparatus that receives data intermittently to start counting the continuous operation request effective time, and for starting its own timer means to count the continuous operation request effective time;

reception processing means for receiving various kinds of data; and

reception control means for controlling the reception processing means,

wherein the reception control means in the communication device applied to the intermittent apparatus starts its own timer means to count the continuous operation request effective time upon receipt of the data in which is set the continuous operation request information at its own reception processing

means.

2. The communication device according to Claim 1, further comprising:

transmission interface means for accepting transmission destination information specifying whether data is to be transmitted by a broadcast or simplex transmission from an apparatus main body and delivering the transmission destination information to the transmission control means; and

transmission setting holding means for holding transmission setting information that is enabled or disabled from an outside,

wherein the transmission control means determines transmission control processing, in which presence or absence of the continuous operation request information and the number of transmissions of data are specified in advance, depending on the transmission destination information, the transmission setting information, and whether the timer means is counting the continuous operation request effective time, and transmits data generated according to the determined transmission control processing to the transmission means.

3. The communication device according to Claim 2, wherein:

in a case where the transmission destination information

specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and the timer means is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted once.

4. The communication device according to Claim 2 or 3, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and the timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted repetitively over a period longer than the intermittent cycle.

5. The communication device according to any one of Claims 2 through 4, wherein:

in a case where the transmission destination information specifies a broadcast transmission and the transmission setting information specifies a state of having been disabled,

the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted once.

6. The communication device according to any one of Claims 2 through 5, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is not set in data and the data is transmitted once.

7. The communication device according to any one of Claims 2 through 5, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted once.

8. The communication device according to any one of Claims 4 through 7, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted repetitively over a period longer than the intermittent cycle.

9. The communication device according to any one of Claims 4 through 7, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is not set in data and the data is transmitted repetitively over a period longer than the intermittent cycle.

10. The communication device according to any one of Claims 2 through 9, wherein:

in a case where the transmission destination information specifies a simplex transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the continuous operation request information is not set in data and the data is transmitted once.

11. The communication device according to any one of Claims 1 through 10, further comprising:

reception setting holding means for holding reception setting information specifying whether data is received continuously or data is received intermittently by the reception means;

wherein in a case where the reception setting information specifies a continuous reception, the reception control means controls the reception means to receive the data continuously, and in a case where the reception setting information specifies an intermittent reception, the reception control means controls the reception means to receive the data intermittently.

12. The communication device according to Claim 2, wherein:

the network system is constructed from one controller that is an apparatus performing a continuous reception, and plural apparatuses other than the controller; and

plural timer means are present in the communication device applied to the controller.

13. The communication device according to Claim 12, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and all the timer means are within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted once or transmitted repetitively.

14. The communication device according to Claim 12 or 13, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and at least one timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the

continuous operation request information is set in data and the data is transmitted repetitively over a period longer than an intermittent cycle.

15. The communication device according to any one of Claims 12 through 14, wherein:

in a case where the transmission destination information specifies a broadcast transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted once.

16. The communication device according to any one of Claims 12 through 15, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is not set in data and the data is transmitted once.

17. The communication device according to any one of

Claims 12 through 15, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted once.

18. The communication device according to any one of Claims 12 through 17, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted repetitively over a period longer than an intermittent cycle.

19. The communication device according to any one of Claims 12 through 17, wherein:

in a case where the transmission destination information

specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is not set in data and the data is transmitted repetitively over a period longer than an intermittent cycle.

20. The communication device according to any one of Claims 12 through 19, wherein:

in a case where the transmission destination information specifies a simplex transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the continuous operation request information is not set in data and the data is transmitted once.

21. The communication device according to any of Claims 12 through 20, further comprising:

reception setting holding means for holding reception setting information specifying whether data is received continuously or data is received intermittently by the reception means,

wherein in a case where the reception setting information

specifies a continuous reception, the reception control means controls the reception means to receive the data continuously, and in a case where the reception setting information specifies an intermittent reception, the reception control means controls the reception means to receive the data intermittently.

22. A communication device applied to each apparatus forming a network system comprising:

transmission processing means for transmitting various kinds of data;

timer means for counting a continued operation request effective time that is a time longer than an intermittent cycle of an intermittent reception and during which transmitted data is always received;

transmission control means for controlling the transmission processing means to transmit a continuous operation request signal causing the timer means in a communication device applied to an intermittent apparatus that receives data intermittently to start counting the continuous operation request effective time, and for starting the timer means of its own to count the continuous operation request effective time;

reception processing means for receiving various kinds of data; and

reception control means for controlling the reception processing means,

wherein the reception control means in the communication device applied to the intermittent apparatus starts its own timer means to count the continuous operation request effective time upon receipt of the continuous operation request signal at its own reception processing means.

23. The communication device according to Claim 22, further comprising:

transmission interface means for accepting transmission destination information specifying whether transmission data including a message to be transmitted is to be transmitted by a broadcast or simplex transmission from an apparatus main body and delivering the transmission destination information to the transmission control means; and

transmission setting holding means for holding transmission setting information that is enabled or disabled from an outside,

wherein the transmission control means determines transmission control processing, in which the continuous operation request signal and the number of transmissions of the transmission data are specified in advance, depending on the transmission destination information, the transmission setting information, and whether the timer means is counting

the continuous operation request effective time, and transmits data generated according to the determined transmission control processing to the transmission means.

24. The communication device according to Claim 23, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and the timer means is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request information is transmitted once and then the transmission data is transmitted once.

25. The communication device according to Claim 23 or 24, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and the timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted repetitively over a period longer than the intermittent cycle and then the

transmission data is transmitted once.

26. The communication device according to any one of Claims 23 through 25, wherein:

in a case where the transmission destination information specifies a broadcast transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted once and then the transmission data is transmitted once.

27. The communication device according to any one of Claims 23 through 26, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the transmission data is transmitted once.

28. The communication device according to any one of Claims 23 through 26, wherein:

in a case where the transmission destination information

specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted once and then the transmission data is transmitted once.

29. The communication device according to any one of Claims 23 through 28, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted repetitively over a period longer than the intermittent cycle and then the transmission data is transmitted once.

30. The communication device according to any one of Claims 23 through 28, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the

timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the transmission data is transmitted repetitively over a period longer than the intermittent cycle.

31. The communication device according to any one of Claims 23 through 30, wherein:

in a case where the transmission destination information specifies a simplex transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the transmission data is transmitted once.

32. The communication device according to any one of Claims 23 through 31, further comprising:

reception setting holding means for holding reception setting information specifying whether data is received continuously or data is received intermittently by the reception means,

wherein in a case where the reception setting information specifies a continuous reception, the reception control means controls the reception means to receive the data continuously, and in a case where the reception setting information specifies an intermittent reception, the reception control means

controls the reception means to receive the data intermittently.

33. The communication device according to Claim 23, wherein:

the network system is constructed from one controller and plural apparatuses other than the controller; and plural timer means are present in the communication device applied to the controller.

34. The communication device according to Claim 33, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and all the timer means are within the continuous operation request effective time, the transmission control means either performs the transmission control processing by which the continuous operation request signal is transmitted once and then the transmission data is transmitted once or performs the transmission control processing by which the continuous operation request signal is transmitted repetitively over a period longer than the intermittent cycle and then the transmission data is transmitted once.

35. The communication device according to Claim 33 or 34, wherein:

in a case where the transmission destination information specifies a broadcast transmission, the transmission setting information specifies a state of having been enabled, and at least one timer means is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted repetitively over a period longer than the intermittent cycle and then the transmission data is transmitted once.

36. The communication device according to any one of Claims 33 through 35, wherein:

in a case where the transmission destination information specifies a broadcast transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted once and then the transmission data is transmitted once.

37. The communication device according to any one of Claims 33 through 36, wherein:

in a case where the transmission destination information

specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the transmission data is transmitted once.

38. The communication device according to any one of Claims 33 through 36, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is within the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted once and then the transmission data is transmitted once.

39. The communication device according to any one of Claims 33 through 38, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is

outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted by repeating a period longer than the intermittent cycle and then the transmission data is transmitted once.

40. The communication device according to any one of Claims 33 through 38, wherein:

in a case where the transmission destination information specifies a simplex transmission, the transmission setting information specifies a state of having been enabled, and the timer means correlated with a transmission destination is outside the continuous operation request effective time, the transmission control means performs the transmission control processing by which the transmission data is transmitted repetitively over a period longer than the intermittent cycle.

41. The communication device according to any one of Claims 33 through 40, wherein:

in a case where the transmission destination information specifies a simplex transmission and the transmission setting information specifies a state of having been disabled, the transmission control means performs the transmission control processing by which the transmission data is transmitted once.

42. The communication device according to any one of Claims 33 through 41, further comprising:

reception setting holding means for holding reception setting information specifying whether data is received continuously or data is received intermittently by the reception means,

wherein in a case where the reception setting information specifies a continuous reception, the reception control means controls the reception means to receive the data continuously, and in a case where the reception setting information specifies an intermittent reception, the reception control means controls the reception means to receive the data intermittently.

43. The communication device according to any one of Claims 1 through 21, further comprising:

transmission and reception management means for managing a sequence of a transmission and a reception,

wherein in a case where the transmission and reception management means is judged as failing in a simplex transmission while the transmission setting information is enabled, the transmission control means performs the transmission control processing by which the continuous operation request information is set in data and the data is transmitted again

repetitively over a period longer than an intermittent reception cycle.

44. The communication device according to any one of Claims 22 through 42, further comprising:

transmission and reception management means for managing a sequence of a transmission and a reception,

wherein in a case where the transmission and reception management means is judged as failing in a simplex transmission while the transmission setting holding means is enabled, the transmission control means performs the transmission control processing by which the continuous operation request signal is transmitted repetitively over a period longer than an intermittent reception cycle and then the data is again transmitted once.

45. A communication method for a network system including a communication device that receives data intermittently, characterized in that:

a communication device at a transmission end includes a transmission control step of transmitting data in which is set continuous operation request information causing timer means in a communication device that performs an intermittent reception to start counting a continuous operation request effective time, and starting its own timer means to count the

continuous operation request effective time; and

the communication device that performs the intermittent reception includes a reception control step of starting its own timer means to count the continuous operation request effective time upon receipt of the data in which the continuous operation request information is set.

46. The communication method according to Claim 45, wherein the transmission control step includes:

a transmission setting reading step of reading out a transmission setting that is enabled or disabled;

a timer starting step of starting the timer means to count the continuous operation request effective time;

an appending step of appending the continuous operation request information to transmission data;

a broadcast transmission step for an intermittent reception of transmitting the transmission data by a broadcast transmission over a period longer than an intermittent cycle assuming that the transmission data is received at another communication terminal that performs an intermittent reception operation;

a broadcast transmission step for a continuous reception of transmitting the transmission data by a broadcast transmission over a period shorter than the intermittent cycle assuming that the transmission data is received at another

communication terminal that performs a continuous reception operation;

a simplex transmission step for an intermittent reception of transmitting the transmission data by a simplex transmission over a period longer than the intermittent cycle assuming that the transmission data is received at another communication terminal that performs an intermittent reception operation; and

a simplex transmission step for a continuous reception of transmitting the transmission data by a simplex transmission over a period shorter than the intermittent cycle assuming that the transmission data is received at another communication terminal that performs a continuous reception operation.

47. The communication method according to Claim 46, wherein a communication device carrying out a broadcast transmission performs:

the appending step and the broadcast transmission step for an intermittent reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the appending step and the broadcast transmission step for a continuous reception followed by the timer starting step

in any other case.

48. The communication method according to Claim 46 or 47, wherein a communication device carrying out a simplex transmission performs:

the appending step and the simplex transmission step for an intermittent reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the simplex transmission step for a continuous reception in any other case.

49. The communication method according to Claim 46 or 47, wherein a communication device carrying out a simplex transmission performs:

the appending step and the simplex transmission step for a continuous reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is within the continuous operation request effective time;

the appending step and the simplex transmission step for an intermittent reception followed by the timer starting step

in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the simplex transmission step for a continuous reception in a case where the transmission setting read out in the transmission setting reading step is disabled.

50. The communication method according to Claim 46 or 47, wherein a communication device during a simplex transmission performs:

the simplex transmission step for a continuous reception in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is within the continuous operation request effective time;

the simplex transmission step for an intermittent reception in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the simplex transmission step for a continuous reception in a case where the transmission setting read out in the transmission setting reading step is disabled.

51. A communication method for a network system including a communication device that receives data intermittently, characterized in that:

a communication device at a transmission end includes a transmission control step of transmitting a continuous operation request signal causing timer means in a communication device that performs an intermittent reception to start counting a continuous operation request effective time, and starting its own timer means to count the continuous operation request effective time; and

the communication device that performs the intermittent reception includes a reception control step of starting its own timer means to count the continuous operation request effective time upon receipt of the continuous operation request signal.

52. The communication method according to Claim 51, wherein the transmission control step includes:

a transmission setting reading step of reading out a state of a transmission setting that was enabled or disabled;

a timer starting step of starting the timer means to count the continuous operation request effective time;

a signal generating step of generating the continuous operation request signal;

a broadcast transmission step for an intermittent

reception of transmitting the continuous operation request signal by a broadcast transmission over a period longer than an intermittent cycle assuming that the continuous operation request signal is received at a communication device that performs an intermittent reception operation;

a broadcast transmission step for a continuous reception of transmitting the continuous operation request signal by a broadcast transmission over a period shorter than the intermittent cycle assuming that the continuous operation request signal is received at another communication device that performs a continuous reception operation;

a simplex transmission step for an intermittent reception of transmitting the continuous operation request signal by a simplex transmission over a period longer than the intermittent cycle assuming that the continuous operation request signal is received at another communication device that performs an intermittent reception operation;

a broadcast transmission step for a continuous reception of transmitting the continuous operation request signal by a broadcast transmission over a period shorter than the intermittent cycle assuming that the continuous operation request signal is received at another communication device that performs a continuous reception operation; and

a simplex transmission step for a continuous reception of transmitting the continuous operation request signal by a

simplex transmission over a period shorter than the intermittent cycle assuming that the continuous operation request signal is received at another communication device that performs a continuous reception operation.

53. The communication method according to Claim 52, wherein a communication device during a broadcast transmission performs:

the signal generating step and the broadcast transmission step for an intermittent reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the signal generating step and the broadcast transmission step for a continuous reception followed by the timer starting step in any other case.

54. The communication method according to Claim 52 or 53, wherein a communication device during a simplex transmission performs:

the signal generating step and the simplex transmission step for an intermittent reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and

the timer means is outside the continuous operation request effective time; and

the simplex transmission step for a continuous reception in any other case.

55. The communication method according to Claim 52 or 53, wherein a communication device during a simplex transmission performs:

the signal generating step and the simplex transmission step for a continuous reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is within the continuous operation request effective time;

the signal generating step and the simplex transmission step for an intermittent reception followed by the timer starting step in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the simplex transmission step for a continuous reception in a case where the transmission setting read out in the transmission setting reading step is disabled.

56. The communication method according to Claim 52 or

53, wherein a communication device during a simplex transmission performs:

the simplex transmission step for an intermittent reception in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is within the continuous operation request effective time;

the simplex transmission step for an intermittent reception in a case where the transmission setting read out in the transmission setting reading step is enabled and the timer means is outside the continuous operation request effective time; and

the simplex transmission step for a continuous reception in a case where the transmission setting read out in the transmission setting reading step is disabled.

57. The communication method according to any one of Claims 45 through 50, further comprising:

a reception notifying transmission step of transmitting a reception notifying message to a transmission source for a reception of a simplex transmission; and

a step of judging whether the simplex transmission succeeded,

wherein a communication device at a reception end performs the reception notifying transmission step at least

upon receipt of the simplex transmission, and

wherein the communication device at the transmission end performs the appending step, the simplex transmission step for an intermittent reception, and the timer starting step in a case where the simplex transmission is judged as failing while the transmission setting is enabled.

58. The communication method according to any one of Claims 51 through 56, further comprising:

a reception notifying transmission step of transmitting a reception notifying message to a transmission source for a reception of a simplex transmission; and

a step of judging whether the simplex transmission succeeded,

wherein a communication device at a reception end performs the reception notifying transmission step at least upon receipt of the simplex transmission, and

wherein the communication device at the transmission end performs the signal generation step, the simplex transmission step for an intermittent reception, and the timer starting step in a case where transmission and reception management means is judged as failing in the simplex transmission while and the transmission setting is enabled.

59. The communication method according to any one of

Claims 45 through 58, wherein:

a counting by the timer means, a start of the counting,
and the judgment are performed independently for each
communication device.